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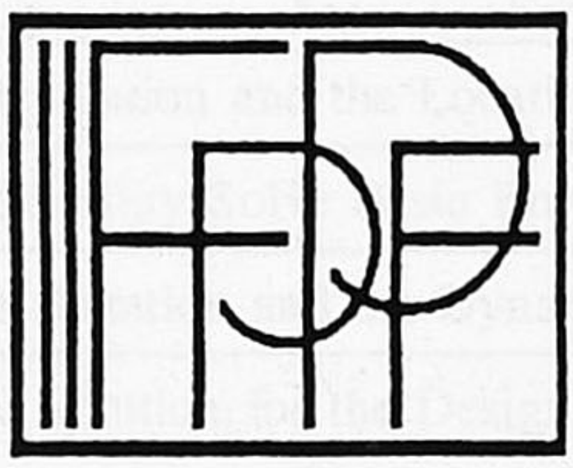

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About This Issue
Public Economics and the Environment

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Introduction

In less than a decade, environmental economics has matured from little more than a special application of Pigovian taxation to a full-fledged branch of the economics discipline. Various developments have contributed to this. Growing populations and economies, for instance, have increased people's awareness that the world's environmental resources are limited. Also, the depletion of the ozone layer and the possibility of global warming have given universal significance to what were hitherto mostly local and regional pollution problems. The environment has emerged as a truly public good. Generally, Coasian negotiations fail to internalize the costs of environmental degradation. Thus, public intervention, possibly using the market mechanism, is called for. In short, few areas in the economics discipline require such a systemwide approach for resolving problems as does environmental economics.

It was highly opportune, therefore, that the International Institute of Public Finance (IIPF) decided to devote its Fiftieth Congress, held at Harvard University in August 1994, to the study of the relationship between environmental and public economics. This special issue of *International Tax and Public Finance* contains thirteen out of the sixty-four papers initially presented at the Congress and subsequently refereed and edited for publication. In addition, fifteen papers are being published simultaneously in a companion volume, entitled *Public Economics and the Environment in an Imperfect World*. We believe that the special issue of this journal as well as the companion volume provide the most comprehensive coverage to date of the theory, empirics, and political economy of the interface between environmental and public economics.

A great number of themes were discussed at the Congress, but the papers below can be conveniently grouped under four headings: double-dividend issues, open-economy issues and policy coordination, innovation and sustained economic growth, and political economy aspects.

Double-dividend issues

To help prices more closely approximate marginal social costs, environmental economists initially focused their attention on corrective taxes, and little attention was paid to the revenue issue. The assumption was that the revenue, if any, would be returned to the private sector in a nondistortionary lump-sum fashion. The call for carbon taxes to slow down global warming, however, made economists aware of the enormous revenue potential of such taxes.

Hence, the use to which the revenue would be put became as important as the way in which it was raised. If the revenue, it was argued, could be used to lower other distortionary taxes, wouldn't that be the nearest thing to a free lunch? And soon, the notion of *double dividend* was coined to give expression to the simultaneous attainment of enhanced environmental quality and a more efficient tax system as a result of the revenue recycling.

Much of the early euphoria evaporated, however, when it was pointed out that in the second-best world with which we have to contend environmental taxes can exacerbate the distortions of the existing tax system through general-equilibrium interactions. Consequently, the burden of proof was reversed, and it became an empirical question whether this tax-interaction effect, as Larry Goulder calls it in the first paper of this issue (which won the IIPF award for the best paper presented at its annual conference), is smaller or larger than the revenue-recycling effect. Specifically, Goulder surveys and evaluates the theoretical and empirical evidence of various double-dividend notions. He finds that the weak claim (returning tax revenues through cuts in distortionary taxes leads to cost savings relative to lump-sum recycling) is easily defended. The stronger version (the costs of revenue-neutral swaps involve zero or negative nonenvironmental costs), in contrast, is subject to serious doubt. Hence, the case for environmental tax reform depends on environmental benefits. The need for measuring these benefits raises significantly the amount of information that policymakers require to make a benefit-cost case for green tax swaps.

The belief in beneficial green tax swaps has been particularly prevalent in Europe, where high rates of unemployment and strong preferences for a large public sector (and hence high tax levels) accentuate the desire for revenue-neutral, growth-enhancing reductions in labor income taxes. In this context, Søren Bo Nielsen, Lars Pedersen, and Peter Sørensen develop a simple endogenous-growth model with pollution externalities to study the links between environmental quality, employment, and long-term growth. The model features voluntary unemployment caused by the tax-transfer system, as well as involuntary unemployment stemming from union monopoly power. Assuming that environmental policy is optimal to begin with, they find that increased environmental concern calls for higher pollution taxes. This environmental policy response implies a fall not only in unemployment but, unfortunately, also in economic growth. If environmental policy is suboptimal at the outset, a properly designed switch from a command-and-control regime with grandfathering of pollution rights toward pollution charges may both improve the efficiency of environmental regulation and raise employment, growth, and consumer welfare without damaging the environment.

In the third paper on the double-dividend issue, Stef Proost and Denise Van Regemorter employ a two-period, dynamic, applied general-equilibrium model to analyze the effects of the introduction of the proposed EU carbon-energy tax in a small open economy—Belgium. The model allows for heterogeneity of households so that income-distribution effects of a green tax reform can be measured. In addition, environmental benefits are incorporated in the welfare function. The authors consider two revenue-recycling strategies—an increase in welfare payments and a reduction of employers' social security contributions—and compare the welfare changes under a regime of fixed or flexible real wages. Confronting benefits and costs, Proost and Van Regemorter find that even the weak double-dividend hypothesis can fail because equity effects dominate. Typically, overall welfare and employment fall, especially if fixed real wages reflect a rigid labor market. This is a typical second-best result: internalizing environmental externalities worsens overall welfare by exacerbating pre-existing distortions in the labor market.

Open-economy issues and policy coordination

One of the major concerns of countries imposing environmental taxes is that the affected polluting industry will pack up and move elsewhere. This might harm employment and economic growth. Obviously, mobile consumers faced with an increase in the price of polluting products and activities may also vote with their feet. On another plane, consumers or producers, particularly in the oil sector, might form coalitions to shift the burden of environmental taxes to the other party. Of course, countries can also spill the effects of their polluting activities over to other countries, a situation calling for international policy coordination. Five papers address these issues in one way or another.

The first paper, by Jim Poterba and Julio Rotemberg, examines how a domestic government should apply border-tax adjustments to an externality-creating intermediate good and the final goods produced with it. Specifically, the objective of the domestic government is to preserve the competitive position of the domestic producers (the relative marginal costs of domestic and foreign producers) of the final goods. The calculation of border-tax adjustments is straightforward when joint production is excluded: the tax on the imported final good should equal the domestic marginal input-output coefficient of the intermediate good. The problem of finding the appropriate border tax adjustment becomes basically insoluble, however, when joint production is introduced. The petrochemical and petroleum refining industries are cases in point: where joint final outputs produced from an intermediate good—crude oil—are common. In these important sectors, therefore, no simple, general rules for border-tax adjustments are available.

Next, Michael Rauscher examines whether the threat of delocation of polluting industries may lead to undesirable competition among countries in the field of environmental regulation. Using a noncompetitive partial-equilibrium framework, Rauscher shows that a wide variety of solutions is possible, ranging from a rat race toward zero taxes to the chicken game and the case of "not in my backyard." Incentives for rent shifting abound, and deviations from jointly optimal policies can be substantial. Therefore, optimistic views of interjurisdictional environmental competition that are based on competitive general-equilibrium models may turn out to be seriously misleading if markets for environmentally intensive goods are noncompetitive.

In the third paper, Dietmar Wellish introduces households that are mobile across jurisdictions to examine the incentives decentralized governments have to carry out efficient environmental policy. His model incorporates elements of "costly migration" in the form of "attachment to place." Wellish shows that if households are perfectly mobile internationally, governments face the correct incentives to set environmental policy, even if pollution crosses frontiers. Intuitively, household mobility induces each government to internalize interjurisdictional externalities, even though it is concerned with the well-being of only its own citizens. On an international scale, however, households are less than perfectly mobile. In that case, interjurisdictional externalities distort decentralized environmental policy.

In the following paper, Olli Tahvonen shifts the attention to the implications of the strategic interaction between buyers of fossil fuels (the burning of fossil fuels is a major source of air pollution) and sellers of such fuels, who consider the pollution problem more or less as irrelevant. If buyers have formed a coalition for the imposition of a CO_2 tax, the equilibrium path of prices depends on whether the sellers are competitive or constitute a resource

cartel. If sellers are competitive, buyers can impose a monopsonistic import tariff and sellers lose their resource rent. If, perhaps more realistically, sellers form a resource cartel, the sellers' export fee (imposed to obtain part of the CO_2 revenue) reduces the buyers' pollution tax. With monopoly power reducing emissions, the buyer's CO_2 tax may fall below the Pigovian level.

In the last paper under this heading, Parkash Chander and Henry Tulkens examine cooperative solutions to global environmental problems in a game-theoretic framework. In the absence of a supranational authority, the treaty must be agreed to voluntarily. The authors show that a scheme of side payments exists that makes each country weakly better off under a global agreement compared to a noncooperative solution or a setting in which a country would cooperate only with a subset of countries. An international agency should be set up to handle the computations and payments so that countries with high preferences for the global public environmental good will transfer resources to the countries that bear high abatement costs.

Innovation and sustained economic growth

The hallmark of good environmental policy is the extent to which it induces the development and adoption of new technologies for the efficient use of scarce environmental resources. Innovation is the product of human ingenuity, which must win the race against environmental degradation as well as resource depletion. Possibly, the survival of the human race is at stake. Three papers arranged under this heading deal with the issues.

Till Requate's paper investigates a model in which output-competing firms are regulated by either emission taxes or auctioned permits. He assumes that there are two types of technologies; the conventional type has relatively high marginal abatement costs, and a new technology features low marginal abatement costs but higher fixed costs. The model produces a remarkable asymmetry between taxes and permits in providing the correct incentives to adopt the new, less polluting technology. In particular, permits allow for partial adoption, while taxes do not. Moreover, if partial adoption is optimal and the social damage function is only moderately steep, taxes lead to overinvestment in the new technology, while permits cause underinvestment. The reverse holds if the damage function is relatively steep. Interestingly, permits, in contrast to taxes, never reduce welfare.

Sjak Smulders argues that human ingenuity is indispensable in simultaneously achieving economic growth and environmental preservation. The accumulation of human knowledge, which is nonrival and most likely unbounded, can in principle overcome the limits that physical and natural resources impose on economic activity. He employs an endogenous growth model in which the bounded physical dimension of economic activity is separated from the unbounded value dimension. Basically, economic value can continue to grow through the substitution of reproducible human inputs for natural inputs as "entropy-saving" innovations dematerialize production. In this way, the increasing returns associated with the public good of knowledge can offset the diminishing returns implied by the second law of thermodynamics.

In the last paper under this heading, Andrea Baranzini and François Bourguignon explore under what conditions sustainable growth coincides with optimal growth. A sustainable